FURUNO

OPERATOR'S MANUAL

VHF RADIOTELEPHONE

MODEL FM-8000

This manual contains only operating information.
For other information, please refer to the following manuals:
• Installation——————Installation Manual
• Servicing——————Service Manual

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⚠ SAFETY INSTRUCTIONS

"**DANGER**", "**WARNING**" and "**CAUTION**" notices appear throughout this manual. It is the responsibility of the operator of the equipment to read, understand and follow these notices. If you have any questions regarding these safety instructions, please contact a FURUNO agent or dealer.

⚠ DANGER	This notice indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	This notice indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	This notice indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury, or property damage.

⚠ WARNING

Do not open the cover of the equipment.

This equipment uses high voltage electricity which can shock,burn,or cause death. Only qualified personnel should work inside the equipment .

Do not dissasemble or modify the equipment.

Fire, electrical shock or serious injury can result.

Immediately turn off the power at the ship's mains switchboard if water or foreign object falls into the equipment or the equipment is emitting smoke or fire.

Continued use of the equipment can cause fire, electrical shock or serious injury.

⚠ CAUTION

Do not place liquid-filled containers on the top of the equipment.

Fire or electrical shock can result if a liquid spills into the equipment.

Do not place heater near the equipment.

Heat can melt the power cord, which can result in fire or electrical shock.

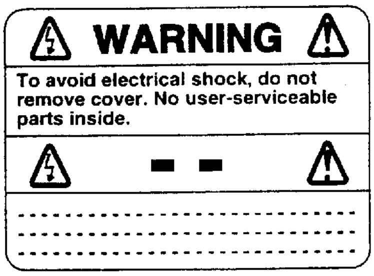
Do not operate the unit with wet hands.

Electrical shock can result.

Use the correct fuse.

Use of the wrong fuse can cause fire or equipment damage.

WARNING Lable attached



Name : Warning Lable (1)
Type : 86-003-1011-0
Code No. : 100-236-230

Introduction

Foreword

The FM-8000 is a highly advanced, fully synthesized 25 W VHF transceiver, designed to satisfy the stringent requirements of marine communications. DSC operation is available with connection of the FURUNO DSC-8V.

About this manual

This manual mainly consists of two parts (PART 1 and PART 2) and an APPENDIX.

PART 1
This part provides operating information: basic rules, controls and indications, and operating procedures.

PART 2
This part provides information for servicing: self-test, maintenance, troubleshooting, and replacement of fuse.

APPENDIX
The APPENDIX contains specifications and VHF channel lists.

Features

- GMDSS operation with DSC Terminal DSC-8V
- Pre-programmed with all international marine channels. Where permitted, USA, weather and private channels are also programmed.
- CH16 key provides for immediate selection of channel 16.
- Automatic selection of channel 16 when the handset is hung.
- Scan function/Dual watch function.
- Advanced "voice" detecting type squelch circuit filters out unwanted noise.
- Remote station (RB-700) connection available.

- Time-out timer limits the continuous transmission to five minutes.

- Self-test

Availability of channel modes

There are three types: Standard, Holland and USA.
The table which follows shows the availability of channel modes.

Channel mode	Type		
	Standard	Holland	USA
INTL	available	available	available
USA	not available	not available	available
WX	not avaialble	not available	available
PRIV	not available	not available	not available

PART 1

1. Basic Rules
2. Controls and Indications
3. Operation

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FM-8000 VHF Radiotelephone

1. Basic Rules

1.1 Status at Start Up

Each time you turn the FM-8000 on it performs a self-test to check for proper operation. After the self-test is completed, the unit starts up with the previous settings of the following controls:

- Channel mode
- Channel number
- Output power
- Speaker on/off
- Dimmer

If the self-test detects equipment fault, error indications appear. For description and meaning of error indications, see page 3-3 in PART2.

When the FM-8000 is turned on it powers the DSC-8V (if connected).

NOTE: When the power is turned off while transmitting, scanning or dual watching, the last settings for the above-mentioned controls are not memorized.

1.2 Key Operation Rules

Key input

When entering a line of data, press each key within 5 seconds of previous key. Otherwise, the FM-8000 will return control to the previous display screen.

SHIFT key

The **SHIFT** key alternates selection of primary and secondary functions. "SHIFT" appears on the LCD when the **SHIFT** key is pressed. You can select a secondary function while "SHIFT" is displayed, up to 5 seconds after pressing the key.

1.3 Automatic Selection of Channel 16

Channel 16 is automatically selected when the handset is hung in the hanger.

1.4 Key Response Beep

One short beep

One short beep sounds to confirm acceptance of key input.

Three short beeps

Three short beeps sound to indicate invalid key input or to inform the activation of time-out timer.

1.5 Remote Control

"REMOTE" indication

- When the remote station RB-700 or the DSC Terminal DSC-8V (if connected) is in operation, the indication "REMOTE" appears on the LCD of the FM-8000.
- Suppose that the FM-8000 has higher priority than the RB-700. When the handset of the RB-700 is picked up with the handset of the FM-8000 also picked up, the indication "REMOTE" on the FM-8000 blinks.

Priority

Higher Priority : FM-8000

Priority	Unit
1	DSC-8V (DISTRESS)
2	Wing Handset
3	FM-8000
4	DSC-8V (other than DISTRESS)
5	RB-700

Higher Priority : RB-700

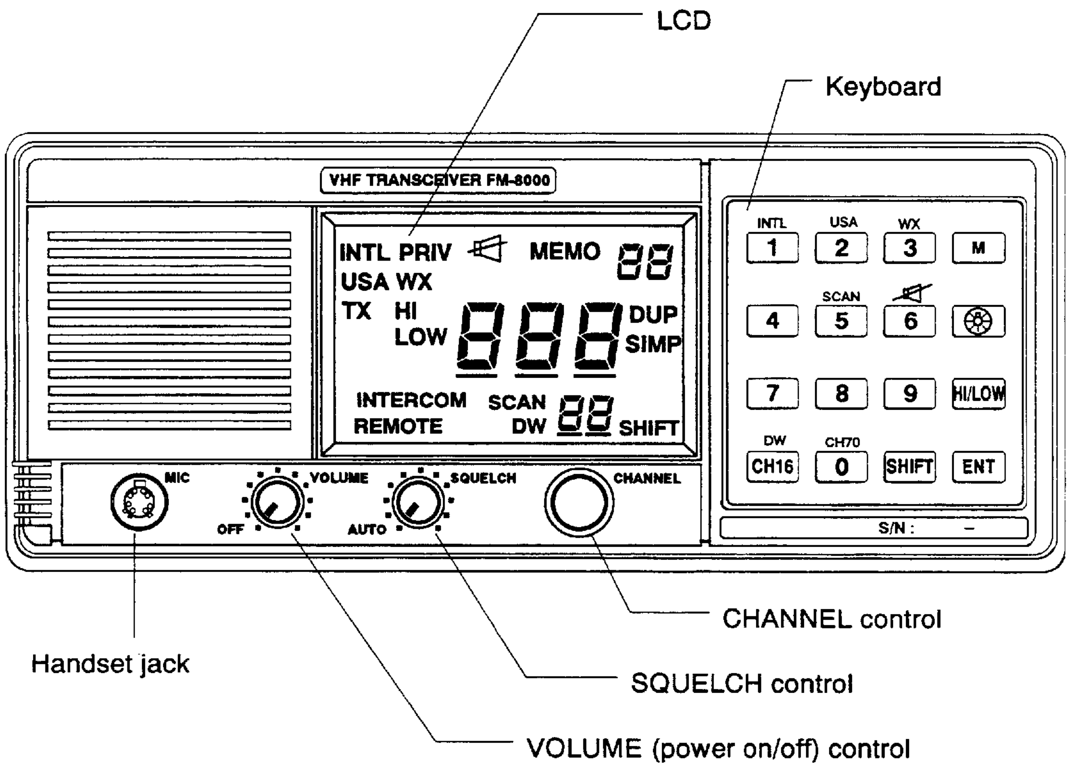
Priority	Unit
1	DSC-8V (DISTRESS)
2	Wing Handset
3	DSC-8V (other than DISTRESS)
4	RB-700
5	FM-8000

Higher priority: FM-8000
Even when "REMOTE" appears on the LCD, the FM-8000 can be operated.

Higher priority: RB-700
While "REMOTE" appears on the LCD, the FM-8000 cannot be operated.

2. Controls and Indications

Panel



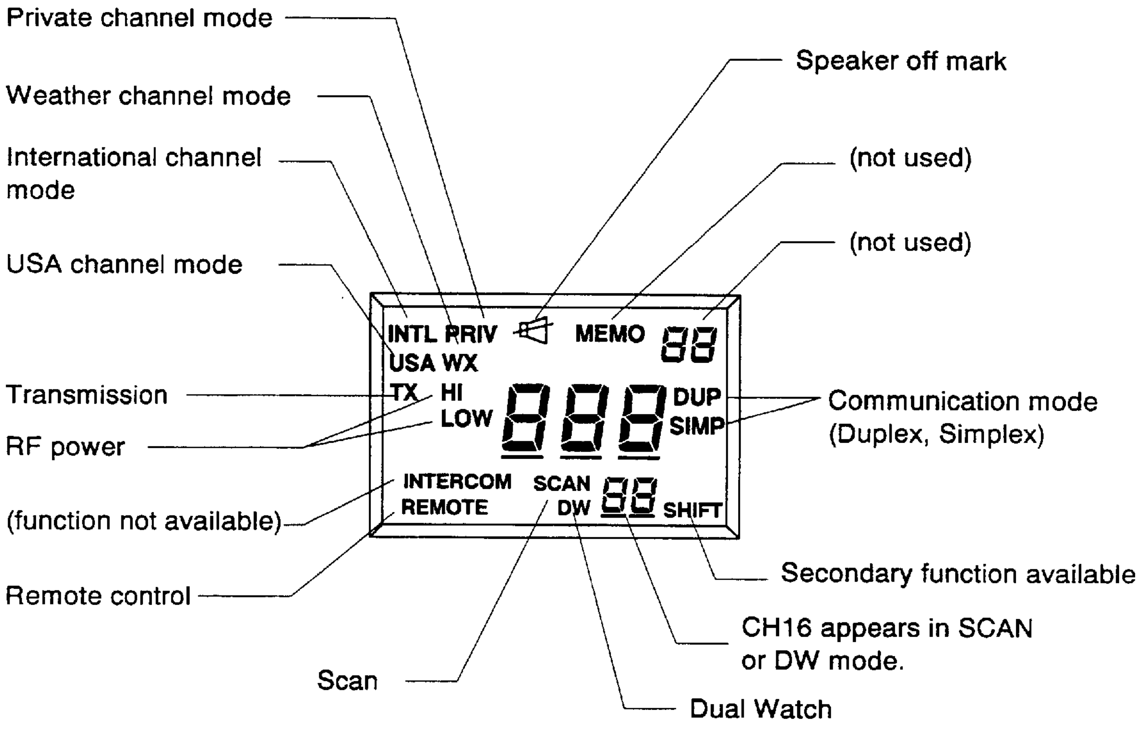
Controls

Control	Function
VOLUME	Turns the power on or off and adjusts the volume of speaker.
SQUELCH	Mutes the receiver when no signal is present on channel selected.
CHANNEL	Selects channel number.

Keys

Key	Function
0—9	Enter numeric data.
INTL	Selects international mode.
USA	Selects USA mode.
WX	Selects weather mode.
M	Recalls private channels.
SCAN	Starts scanning.
	Turns the speaker on or off.
	Adjusts backlighting for LCD and keyboard.
HI/LOW	Selects the output power for HI (25W) or LOW (1W).
CH16	Selects international channel 16.
DW	Starts dual watching.
CH70	Selects channel 70 (DSC channel).
SHIFT	Enables selection of secondary function.
ENT	Terminates data entry.

Indications



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3. Operation

3.1 Basic Operation

Turning the power on or off/ adjusting speaker volume

The **VOLUME** control turns the power on or off and adjusts the volume of the speaker.
To turn the power on, turn the control clockwise until you hear a click. Further clockwise rotation raises the volume of the speaker.
To turn the power off, turn the control fully counterclockwise until you hear the click.

Adjusting the squelch

The squelch is activated by voice tone or signal level.

To activate by voice tone
Set the **SQUELCH** control to the AUTO position.

To activate by carrier level
Turn the **SQUELCH** control slowly clockwise until receiver noise just fades away. Do this when no traffic is being received.

Transmitting/ selecting output power

Press the **PTT** switch to talk and release it to listen.
Each press of the **HI/LOW** key selects HI or LOW output power. The transmitter power is automatically set for low on the following channels:
International: CH15/17
USA: CH13/67
To transmit on USA channel 13 or 67 in high power, keep the **HI/LOW** key pressed while talking into the handset.

Turning the loudspeaker on or off

The **speaker** [ ] key turns the speaker on and off. To turn the speaker on or off, press the **SHIFT** key and then press the **speaker** [ ] key. The speaker off mark ( ) appears on the LCD when the speaker is off.

Adjusting the dimmer

The **dimmer** [ ] key adjusts the backlighting for both the LCD and the keyboard in four steps: bright, normal, dim and off. Each time you press the key, the backlighting changes in the above sequence.

3.2 Selecting Channel Modes

Channel mode

The FM-8000 provides four channel modes:
- International (INTL)
- USA
- Weather (WX)
- Private (PRIV)

■ **NOTE:** The private mode is available only by prior authorization. Private channel programming should be done by a FURUNO agent or dealer.

Selection

To select INTL, USA or WX mode
Press the **SHIFT** key, then press the **INTL**, **USA** or **WX** key.

To select PRIV mode
Press the **M** key. Private channel appears on the LCD.

3.3 Selecting Channels

Selection

You can select a channel by entering it manually with numeral keys or automatically by operating the **CHANNEL** control.

Manual entry of single-digit channel number
There are two methods by which you can enter a single-digit channel number:
- by entering "0" and channel number, or
- by entering single-digit channel number and pressing the **ENT** key.

For example, to enter channel 5, you can press the **0** and **5** keys, or press the **5** key and the **ENT** key.

Channel lists

Marine VHF channel lists are provided in the APPENDIX.

3.4 Dual Watch

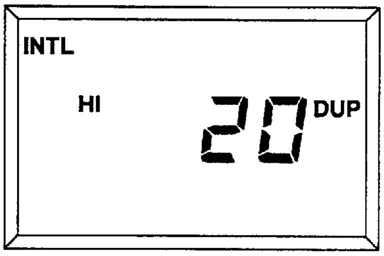
Introduction

The dual watch allows you to keep watch on channel 16 and another channel. CH16 and channel selected are watched at intervals of 0.15 second and one second, respectively. For example, another channel is CH20:

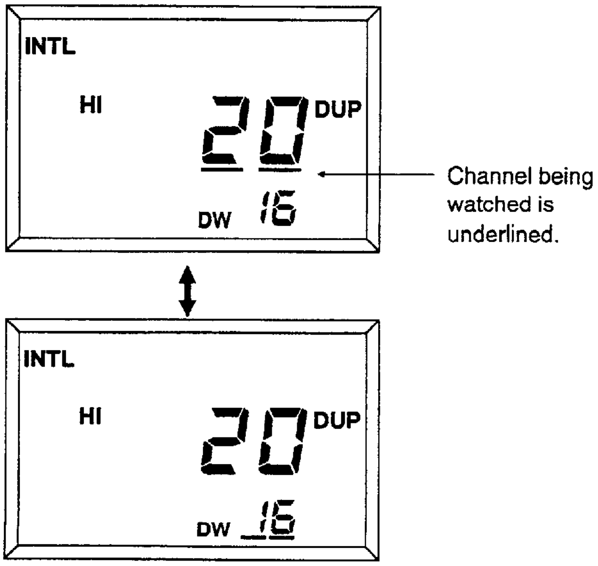
Starting

<u>**Procedure**</u>

1. Select the channel you want to watch along with CH16 by operating the **CHANNEL** control.



2. Press the **SHIFT** key followed by the **CH16** key. The indication "DW" appears on the display.



Stopping

Press any key, or press the PTT switch on the handset.

■ **NOTE:** When the receiver finds a signal on:
<u>**channel 16**</u>
It locks on channel 16 and restarts dual watching five seconds after the signal on channel 16 has gone.
<u>**another channel**</u>
It continues dual watching. (It doesn't lock on the channel.)

3.5 Scan

The receiver scans all channels in the channel mode selected in ascending order, watching CH16 between channels. It stops scanning when it receives a signal whose level (or voice tone) is higher than a preset level. The receiver restarts scanning after the scan stop time has elapsed.

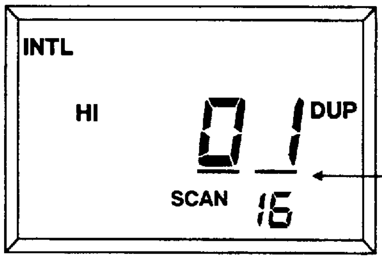
<u>**Scan channel order**</u> **(International mode)**

1 ⇨ 16 ⇨ 2 ⇨ 16 ⇨ 3 ⇨ 16 ⇨ 4 ⇨ ....
⇧ ⇩
16 ⇦ 88 ⇦ 16 ⇦ 87 ⇦ 16 ⇦ 86 ⇦ 16 ⇦ ....

Starting

<u>**Procedure**</u>

1. Select a channel mode.
2. Press the **SHIFT** key followed by the **SCAN** key. The receiver starts scanning.



Channel being watched is underlined.

Stopping

Press any key, or press the **PTT** switch on the handset.

■ **NOTE:** When the receiver finds a signal on CH16 it receives the signal until it has gone and further monitors CH16 for five seconds. Then, it restarts scanning.

3.6 Ignoring Remote Control from RB-700

Introduction

The remote station RB-700 can be operated whenever the handset of the FM-8000 is hung. This is true even if the FM-8000 has higher priority than the RB-700. If you want the FM-8000 to retain priority with its hanset hung when it has priority over RB-700, follow the procedure shown below.

To enter this mode

Procedure

1. Press the **SHIFT** key of the FM-8000 before hanging up the handset.
2. Hang up the handset within five seconds.

To quit this mode

Pick up the handset, then hang it on the hanger.

■ **NOTE:** When the handset of the remote station is picked up, "REMOTE" blinks on the LCD of the FM-8000 in this mode.

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PART 2

1. Self-test
2. Maintenance
3. Troubleshooting
4. Replacement of Fuse

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4. Replacement of Fuse — 4-1

1. Self-test

Introduction

The FM-8000 provides two types of self-tests:

- Self-test at start up
- Self-test in the test mode

1.1 Self-test at Start Up

When you turn on the FM-8000, it automatically conducts a self-test to check for proper operation.

Contents

The devices checked in this self-test are:

- Transmitter PLL
- Receiver PLL
- ROM in the CPU
- RAM in the CPU, and
- E^2PROM.

Starting

Turn the power on.

Result

When the self-test is completed, the FM-8000 is ready for operation. If equipment fault is found, error indications appear on the LCD. Refer to page 3-3 in PART 2.

1.2 Self-test in the Test Mode

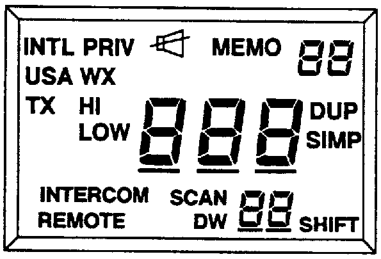
Contents

The items checked (or displayed) are:
- LCD
- Keyboard
- Switches (PTT, handset hanger)
- Version number, and
- System setting data.

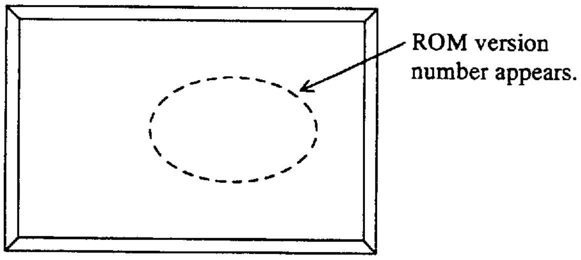
Starting

While pressing and holding down the **ENT** key, turn the power on. The FM-8000 enters the test mode and starts the self-test automatically.

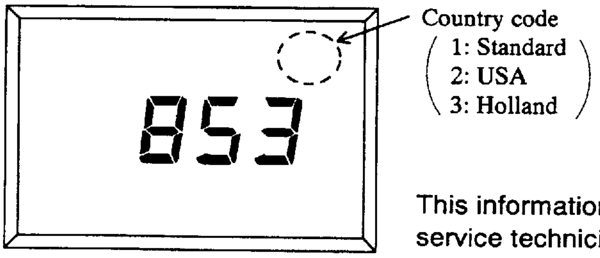
- All segments appear for 3 seconds.



- CPU version number appears for 2 seconds.



- System setting data appears.



This information is for service technicians.

Switch test

After system setting data appears, you can check the PTT, handset hanger and keyboard switches.

First, set the handset in the hanger. Then, press keys and switches one by one. Confirm that the indications which appear on the display match those shown in the tables which follow.

Switches

Switch	PTT	Handset hanger
Indication	**TX**	**REMOTE**

Keyboard

Key	1 (INTL)	2 (USA)	3 (WX)	M
Indication	**1, INTL**	**2, USA**	**3, WX**	**MEMO, PRIV, 88**
Key	4	5 (SCAN)	6 (🔇)	⊛
Indication	**4**	**5, SCAN**	**6, 🔇**	**(*1)**
Key	7	8	9	HI LOW
Indication	**7, INTERCOM**	**8**	**9**	**HI, LOW**
Key	CH16 (DW)	0	SHIFT	ENT
Indication	**SIMP, DW**	**0**	**SHIFT**	**TX**

(*1) Press this key several times and confirm that the brightness changes in the sequence of dim, medium, bright and off.

2. Maintenance

2.1 Regular Check

Introduction

The FM-8000 is designed and constructed to give the user many years of trouble-free performance. However, no machine can perform to the utmost of its ability without regular maintenance. For better performance:

- Have a licensed radiotelephone technician check the transceiver and antenna before initial operation and once annually to ensure compliance with pertinent regulations.
- A quarterly routine maintenance program should be established and should include at least the following:

Item	Check Point
Connectors & Cables	Check all connectors (antenna, power, handset, ground, etc.), cables and wires for proper seating, foreign material and corrosion. Wipe off any foreign material with a clean cloth. Replace worn parts. Carefully inspect the coaxial cable connected between the antenna and the transceiver for external damage.
Transceiver	Accumulated dust or dirt on the exterior surface and keyboard can be removed with a clean, soft cloth. Clean the LCD with lens tissue or soft cloth to prevent scratching. **Do not use chemical solvents to clean the transceiver. They may harm plastic, paint and markings.**
Antenna	Inspect the antenna insulators for corrosion. Check condition of soldered connections. Remove salt deposits with fresh water.
Power Supply	The FM-8000 is powered by 24VDC +30%, -10% power. Confirm that the power supply is operating within this rating. Check battery terminals and ship's mains switchboard for proper seating and corrosion.
Fuses	Fuse holders are subject to corrosion which increases circuit resistance. Fuses should be removed from their holders, inspected, and cleaned of any accumulation of dirt or corrosion.

3. Troubleshooting

3.1 Troubleshooting List

Introduction

The cause of most VHF operating problems is the antenna/antenna feeder or power supply, so those are the first places to check if there is trouble.

⚠ WARNING

Do not open the cover of the equipment.

This equipment uses high voltage electricity which can shock, burn, or cause death.Only qualified personnel should work inside the equipment.

Symptom	Possible Cause	Remedy
Cannot turn on power.	1. Power is off at mains switchboard. 2. Power lead has loosened. 3. Mains battery has discharged. 4. Fuse has blown.	1. Turn mains switch on. 2. Check plug and battery connections. 3. Check battery electrolyte level and charging system.
LCD looks normal but no audio output.	1. Speaker is off. 2. Squelch setting is too high. 3. Volume setting is too low. 4. External speaker connection has loosened.	1. Press **SHIFT** key followed by **speaker** key. 2, 3. To confirm audio output, turn **SQUELCH** fully counterclockwise (not AUTO position) and slowly turn VOLUME clockwise. 4. Check connection.
Noise but no or poor signal reception.	1. Loosened ANT connector. 2. Dismasted antenna. 3. Damaged antenna cable. 4. Obstruction (mountain, crane, etc.) within path of radio wave. 5. Transmitter is too far away, or transmitting in low power.	1. Check ANT connector. 2, 3. Replace antenna. 4, 5. Line-of-sight is a characteristic of VHF communications.
"TX" appears but no or low output power.	1. Refer to items 1 thru 4 above. 2. Power setting is LOW. 3. The channel is to be operated in low power. 4. "HI" blinks.	2. Set power to HIGH. 3. INTL CH15, 17 and USA CH13, 67 are low power channels. 4. See section on error messages.

(Continued)

3.1 Troubleshooting List, continued

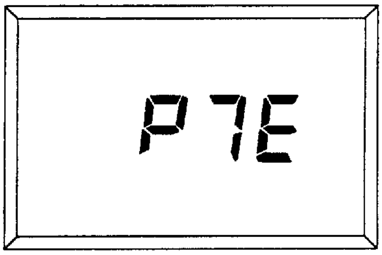
Symptom	Possible Cause	Remedy
"TX" does not appear when PTT switch is pressed.	1. Attempting transmission over a channel assigned for reception only; CH15(USA), WX0 thru WX9, etc. 2. Transceiver is in dual watch or scanning mode. 3. Check handset for damage. 4. Beeps emitted when transmitting.	1. Refer to channel list. 2. Change mode. 3. Replace handset if necessary. 4. See section on error indications.
Cannot use private channel.	Private channels have not been programmed.	Authorization required to use private channels.
Scan and DW modes do not function.	Squelch setting too low.	Adjust **SQUELCH** control so noise just fades out.
Channel 16 called without operator intervention.	Channel 16 is selected whenever the handset is hung up.	

3.2 Error Indication

When the FM-8000 detects equipment error it displays a code which identifies the offending device. The figures which follow show the codes and their meanings. For any error, consult a FURUNO agent or dealer.

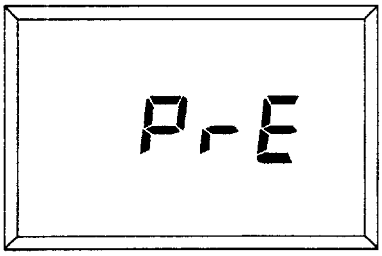
Transmitter PLL error

PTE indication blinks for 3 seconds.



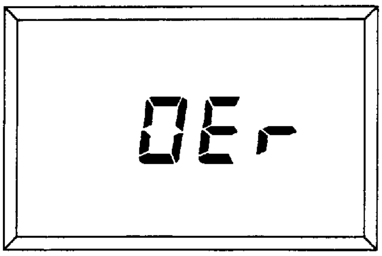
Receiver PLL error

PrE indication blinks for 3 seconds.



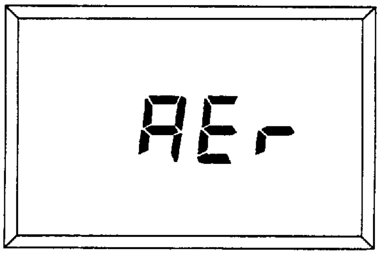
ROM in the CPU

OEr indication blinks for 3 seconds.



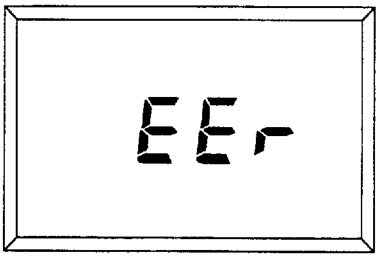
RAM in the CPU error

AEr indication blinks for 3 seconds.



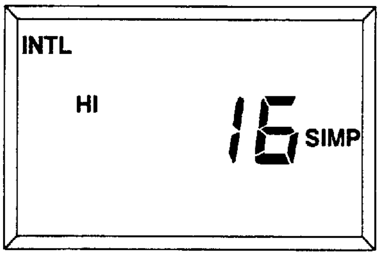
E[2]PROM error

EEr indication blinks for 3 seconds.



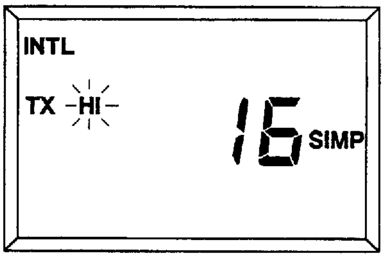
Transceiver section error

TX indication does not appear when the PTT switch is pressed. Three beeps are released.



Automatic power reduction function

Output power is automatically reduced to 6 W when the temperature at the power amplifier is high, to protect the final stage transistors. “HI” indication blinks when power is reduced.



Wait until the unit cools down (“HI” doesn’t blink when PTT is pressed) before resuming operation.

4. Replacement of Fuse

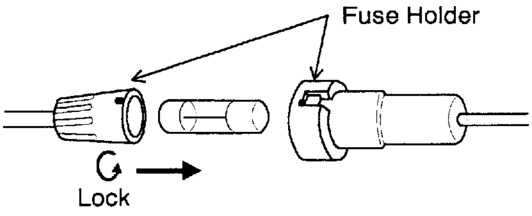
⚠ CAUTION

Use the correct fuse.

Use of the wrong fuse can cause fire or equipment damage.

Introduction

To protect the unit from reverse polarity and equipment fault, two 10A fuses are provided in snap-in holders on the power cable. If a fuse blows, find the cause of the problem before replacing it. ***Never use a fuse rated more than 10A since it may cause serious damage to the equipment.***



APPENDIX

Specifications
VHF Channel Lists

Specifications

GENERAL

Frequency Range	TX : 155.000 to 161.475 MHz RX : 155.000 to 163.275 MHz
Channel Program	INTL Channel: 55 USA Channel: 55 WX Channel: 10 PRIV Channel: 20 (authorization required)
Oscillator	PLL synthesizer
Communication System	Semi-duplex, Simplex
Class of Emission	G3E, G2B
Antenna Impedance	50 Ω
Dimensions	258 (W) × 108 (H) × 245 (D) mm
Mass	3.7 kg
Environment	Temperature: −20 ℃ to +55 ℃ Relative Humidity: 93% at +40 ℃
Power Supply	24 VDC +30 % −10 % Current Drain Transmit: 5.5 A max. Receive: 0.9 A max. Stand-by: 0.4 A max.

TRANSMITTER

Output Power	25 W (HI), 1 W (LOW)
Audio Response	6 dB/oct, +1 dB, −3 dB pre-emphasis
Frequency Deviation	± 5 kHz max.
Spurious Emission	Less than 0.25 μ W
Modulation System	Reactance Type

RECEIVER

Receiving System	Double-conversion Superheterodyne
Intermediate Frequency	First IF: 16.9 MHz Second IF: 455 kHz
Sensitivity	Less than −6 dBμV (at 12 dB SINAD)
Selectivity	More than 70 dB
Spurious Response	More than 70 dB
Audio Response	6 dB/oct, +1 dB, − 3 dB de-emphasis
Ham and Noise	Less than −40 dB
Audio Output	Internal Speaker: 2 W min.(8 Ω) Handset: 1 mW (200 Ω) Line output: 0 dBm ± 10 dB

Marinte VHF Channel Lists

INTERNATIONAL CHANNELS

CH	TX	RX	CH	TX	RX
01	156.050	160.650	60	156.025	160.625
02	156.100	160.700	61	156.075	160.675
03	156.150	160.750	62	156.125	160.725
04	156.200	160.800	63	156.175	160.775
05	156.250	160.850	64	156.225	160.825
06	156.300	156.300	65	156.275	160.875
07	156.350	160.950	66	156.325	160.925
08	156.400	156.400	67	156.375	156.375
09	156.450	156.450	68	156.425	156.425
10	156.500	156.500	69	156.475	156.475
11	156.550	156.550	70	156.525	156.525
12	156.600	156.600	71	156.575	156.575
13	156.650	156.650	72	156.625	156.625
14	156.700	156.700	73	156.675	156.675
15	156.750	156.750	74	156.725	156.725
16	156.800	156.800	77	156.875	156.875
17	156.850	156.850	78	156.925	161.525
18	156.900	161.500	79	156.975	161.575
19	156.950	161.550	80	157.025	161.625
20	157.000	161.600	81	157.075	161.675
21	157.050	161.650	82	157.125	161.725
22	157.100	161.700	83	157.175	161.775
23	157.150	161.750	84	157.225	161.825
24	157.200	161.800	85	157.275	161.875
25	157.250	161.850	86	157.325	161.925
26	157.300	161.900	87	157.375	161.975
27	157.350	161.950	88	157.425	162.025
28	157.400	162.000			

(MHz)

USA CHANNELS

CH	TX	RX	CH	TX	RX
01A	156.050	156.050	60	156.025	160.625
02A	156.100	156.100	61	156.075	160.675
03A	156.150	156.150	62	156.125	160.725
04A	156.200	156.200	63A	156.175	156.175
05A	156.250	156.250	64	156.225	160.825
06	156.300	156.300	65A	156.275	156.275
07A	156.350	156.350	66A	156.325	156.325
08	156.400	156.400	67	156.375	156.375
09	156.450	156.450	68	156.425	156.425
10	156.500	156.500	69	156.475	156.475
11	156.550	156.550	70	156.525	156.525
12	156.600	156.600	71	156.575	156.575
13	156.650	156.650	72	156.625	156.625
14	156.700	156.700	73	156.675	156.675
15		156.750	74	156.725	156.725
16	156.800	156.800	77	156.875	156.875
17	156.850	156.850	78A	156.925	156.925
18A	156.900	156.900	79A	156.975	156.975
19A	156.950	156.950	80A	157.025	157.025
20	157.000	161.600	81A	157.075	157.075
21A	157.050	157.050	82A	157.125	157.125
22A	157.100	157.100	83A	157.175	157.175
23A	157.150	157.150	84	157.225	161.825
24	157.200	161.800	85	157.275	161.875
25	157.250	161.850	86	157.325	161.925
26	157.300	161.900	87	157.375	161.975
27	157.350	161.950	88A	157.425	157.425
28	157.400	162.000			

(MHz)

WEATHER CHANNELS

CH	RX
WX1	162.550
WX2	162.400
WX3	162.475
WX4	162.425
WX5	162.450
WX6	162.500
WX7	162.525
WX8	161.650
WX9	161.775
WX0	163.275

(MHz)